

found that the magnetic hold on the lids will be more secure if the magnet 51 is configured with a yoke, i.e., a U-shaped core with poles 52 and 53 arranged approximately parallel at some distance from each other and facing towards the lid. It is advantageous if the yoke of the electromagnet 51 with the legs or poles 52 and 53 and the turn-around portion 54 has a "soft" magnetization characteristic, so that the remanent magnetization will be as small as possible.

An anchor element 55 in the lid 32' is positioned opposite the magnet 51. As a design choice, the preferably ring-shaped anchor element 55 may have a plastic cover layer 56 and may be pressed or snapped into a recess 57 of the lid 32'. The lid 32' is seated in a centered position on the sample beaker 32, preferably by means of a centering rim 58, to ensure a precisely centered alignment of the anchor element 55 with the magnet 51. While a centering rim of the kind illustrated in Fig. 2 is preferred, it is obvious that one could also use individual projections distributed over the circumference of the lid 32', or a circumferential groove that is engaged by the rim of the beaker. For an analogous reason, i.e., to assure the centered positioning of each seating cutout 5 under the magnet 51, it is preferable to use a stepper motor as a drive source for the movement of the sample tray 4, because a stepper motor provides a more precise positioning than other kinds of motors.

It is obvious that one could also choose to have more than one magnet-anchor element in the lid 32'. However, this

would make the design of the lid-opening device somewhat more complex. In general, it will not be critical for the magnet-anchor element 55 to be exactly at the center of gravity of the lid 32'. However, with an offset anchor element, there could be malfunctions because the upward- and downward-directed forces acting on the lid are not in line with each other, so that the hold between the electromagnet and the magnet-anchor element is less secure. It is therefore preferred if the anchor element 55 is centered as much as possible.

In accordance with the advantageous embodiment described above, the anchor element 55 is covered from above by the plastic top layer 56 and from below by the bottom 59 of the recess 57. This has several advantages: On the one hand, aggressive vapors rising from the sample cannot corrode the metal of the anchor element 55 from below because the latter is protected by the bottom 59 of the recess. On the other hand, there is also protection from above, so that drops of an aggressive liquid falling on the lid 32' can likewise not corrode the anchor element. As a particularly preferred solution, rather than inserting the anchor element into a recess (as described above), the anchor element is completely molded into the lid 32', where the latter likewise consists of a non-magnetic material, particularly a polymer that is in general chemically inert.

In addition, the plastic layer 56 also serves as a spacer to ensure a minimum distance d from the magnet 51.

This is necessary because with a safe distance of $\geq 2H$ between the lid and the magnet 51, the latter has to be designed to generate an attractive force strong enough to reach across the gap. However, with a strong magnet, there is a risk that even a small remanent magnetization may hold the lid 32' suspended in the position 55' indicated by a broken line, so that the lid cannot be placed back on the sample container after the analysis. Obviously, a spacer could also be realized in a different form, e.g., by upward projections of the lid that would bear against the underside of the arm 50a, but as explained above, the layer 56 of plastic material also serves other purposes.

The arrangement where the two poles 52, 53 lie opposite the anchor element 55 creates a closed magnetic circuit of flux lines 60 (shown in broken lines) which is conducive to a secure hold of the lid 32'. A ring-shaped anchor element 55 works particularly well, because in this case the flux pattern is independent of the orientation of the lid. It is of course advantageous if the ring diameter of the anchor element 55 corresponds approximately to the distance between the magnet poles 52, 53.

The design of the lid-opening device 50 with an electromagnet also has the advantage that there are no moving parts. As a result, the device has an uncomplicated layout and is assured to work without malfunction even if the switch S is closed in a situation when there is no lid on a sample